

WFIRST-AFTA Science Definition Team

Final Report 2015

Outline

v8 November 20, 2014

1. INTRODUCTION (Spergel/Gehrels)

2. WFIRST SCIENCE

2.1 SCIENCE OVERVIEW (Moos)

2.2 DARK ENERGY & COSMOLOGY (Weinberg)

 2.2.1 *Introduction to Dark Energy* (Wang)

 2.2.2 *The Supernova Survey* (Perlmutter/Baltay)

 2.2.3 *The High Latitude Survey.* (Hirata)

 2.2.4 *Photo-z Calibration* (Rhodes/Hirata)

 2.2.5 *Tests of Cosmic Acceleration Models* (Wang/Weinberg)

2.3 HIGH LATITUDE SURVEYS: GENERAL ASTROPHYSICS

 (Postman/Donahue/Kalirai)

 2.3.1 *The First Billion Years of Cosmic History*

 2.3.2 *Mapping Dark Matter on Intermediate and Large Scales*

 2.3.3 *Kinematics of Stellar Streams in our Local Group of Galaxies*

 2.3.4 *Discovering the Most Extreme Star Forming Galaxies and Quasars*

 2.3.5 *Deep Drilling Fields*

2.4 EXOPLANET SCIENCE

 2.4.1 *Extrasolar Planet Science Landscape* (Macintosh / Gaudi)

 2.4.2 *Completing the Exoplanet Cencus with Microlensing* (Bennett / Gaudi)

 2.4.3 *Discovering and Characterizing Nearby Exoplanets with a Coronagraph*
 (Macintosh/Greene/Kasdin/Guyon/Breckinridge)

2.5 GALACTIC BULGE FIELD: GENERAL ASTROPHYSICS (Gaudi/Bennett)

2.6 OPPORTUNITIES FOR THE GUEST OBSERVER PROGRAM (Kalirai/Dressler)

2.7 SYNERGY WITH JWST (Rauscher/Dressler)

2.8 RELATION TO OTHER OBSERVATORIES (Rhodes/Wang)

3. WFIRST DESIGN REFERENCE MISSION

3.1 OVERVIEW

3.2 TELESCOPE

 3.2.1 Hardware Description

 3.2.2 Risk Reduction Activities

 3.2.3 Integration & Test

 3.2.4 Development Schedule

3.3 WIDE-FIELD INSTRUMENT

 3.3.1 *Hardware Description*

 3.3.1.1 *Wide-Field Channel*

 3.3.1.2 *Integral Field Unit Channel*

 3.3.1.3 Calibration Hardware (if scientific requirements define a need)

 3.3.2 *Technology Development*

 3.3.3 Risk Reduction Activities

- 3.3.4 Integration & Test
 - 3.3.5 Development Schedule
 - 3.4 CORONAGRAPH
 - 3.4.1 *Hardware Description*
 - 3.4.1.1 Coronagraph
 - 3.4.1.2 Integral Field Spectrograph
 - 3.4.1.3 Low Order Wavefront Sensor
 - 3.4.1.4 Calibration Hardware (if scientific requirements define a need)
 - 3.4.2 Technology Development
 - 3.4.3 Risk Reduction Activities
 - 3.4.4 Integration & Test
 - 3.4.5 Development Schedule
 - 3.5 FINE GUIDANCE SYSTEM (FGS)
 - 3.6 SPACECRAFT
 - 3.7 INTEGRATED MODELING / MISSION PERFORMANCE
 - 3.8 GROUND SYSTEM
 - 3.9 CONCEPT OF OPERATIONS
 - 3.9.1 Observing Plan
 - 3.10 COST & SCHEDULE
- 4. SCIENCE POLICIES (Gehrels/Spergel/Benford)**
- 4.1 DATA RIGHTS CONSIDERATIONS
 - 4.2 SCIENCE TEAM SELECTION CONSIDERATIONS
- 5. PATH FORWARD**
- 6. CONCLUSION**

Appendices

- A. Impact of Telescope Temperature (Kruk, Content)
- B. Orbit Discussion (L2 vs GEO) (Melton, Hirata)
- C. GO white papers (Kalirai)
- D. Pasadena 2014 Conference Summary (Helou)
- E. RV exoplanet study (Traub)
- F. Precursor observations (Bennett, Macintosh)
- G. LSST/Euclid/WFIRST synergies (Spergel)
- H. Foreign interest (Gehrels, Benford)